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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/732,712	12/11/2000	Taizou Itou	Q57601	2910

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EXAMINER

GAKH, YELENA G

ART UNIT	PAPER NUMBER
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1743

DATE MAILED: 03/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/732,712	Applicant(s) ITOU ET AL.	
	Examiner Yelena G. Gakh, Ph.D.	Art Unit 1743	<i>eb</i>

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10, 13-16 and 22-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10, 13-16 and 22-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 December 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date: _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The Response filed on 01/20/04, is acknowledged. Claims 1-10, 13-16 and 22 pending in the Application are not amended. New claims 23 and 24 are added.
2. Since the application is not amended and the Applicants' arguments are not persuasive, as it will be discussed below, the application stays rejected on the grounds established in the previous Office action.

Specification

3. The specification is objected to as containing the subject matter, which is not written in such a clear and definite form as to allow any practitioner in the art to use the method in its most efficient way.

The specification discloses measuring a trace amount of water in purified ammonia using IR. While the goal of the method disclosed is measuring water present in the amounts of less than 10 ppm, 1 ppm and even less than 0.1 ppm, the reference gas used for such measurements is described as containing less than 10 ppm of water. It is not clear, how is it possible to quantitatively measure less than 1 ppm or even 0.1 ppm of water in analytical gas, when the reference gas may contain 10 and even 100 times more water than the analyte sample, especially the unknown amount of water in the reference gas? Also, according to Figure 1, the reference and the analyte samples are taken from two separate tanks, which may contain different amount of water, even if it less than 10 ppm each.

Further, the measurements are taken at certain wave numbers, corresponding to the ranges where water and ammonia signals are not overlapped. Since nothing is said about measuring (running) IR spectra for the reference and analyte samples first, it is not clear, if actually the real IR spectra are taken. If actual IR spectra are taken, no subtraction of the IR spectrum of the reference from the IR spectrum of the analyte is discussed, although using IR spectrum of the reference gas as the background is mentioned. Therefore, it is not clear, if such subtraction takes place, or

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not. If both IR spectra are measured, but no subtraction takes place, then it is also not clear, how correction for the huge signal of NH_3 is done.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1-10, 13-16 and 22 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the reference with exact amount of water, which should be much less than the water content of the analyte under measurement, does not reasonably provide enablement for the reference with the unknown amount of water, which also may exceed the water content of the analyte 10 and even 100 times. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention commensurate in scope with these claims. There is no way for anyone of ordinary skills in the art to measure amounts of water in the analyte sample in ranges of 1 ppm and even 0.1 ppm, using the reference with the amount of water 10 and even 100 times higher, especially when this amount is not known. Moreover, no one of ordinary skill in the art can measure the amount of water without obtaining full IR spectrum in the range of water absorbance, which is not recited in the claims. Also, since it is well known that water signal and NH_3 signal overlap, the correction for NH_3 signal should take place. Measuring intensity of the signal at a wave number at which ammonia and water signals do not overlap does not make sense, if such wave number is not in the range of the water signal.

In claim 22 it is not clear, what is the difference between two gases – one used as a reference gas with an unknown amount of water < 10 ppm, and another being an analyte, obtained by heating liquefied ammonia with the unknown amount of water <

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10 ppm? It is possible that heating liquefied ammonia will lead to increased amount of water content due to the water evaporation from the liquefied ammonia; however, it is not clear, how is it possible to measure one unknown amount of water using another unknown amount of water, especially when the samples are coming from different tanks (Figure 1), which by definition have different amount of water? This embodiment is not clear.

6. Claims 23 and 24 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the method wherein gas/liquid partition coefficient for ammonia varies with the range 0.1-0.01 for specific pressure and temperature (not disclosed in the specification), does not reasonably provide enablement for any temperature and pressure. It is well known in the art that thermodynamic properties of mixtures, including gas-liquid partition coefficients, depend on such parameters as pressure and temperature, see e.g. "The International Association for the Properties of Water and Steam, 2001, or Guillevic et al. 1985.

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 1-10, 13-16 and 22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1 and 22 recite, "measuring infrared absorption intensity of the reference gas". It is not clear how is it possible to measure infrared absorption intensity of the gas as a whole, when the gas comprises at least two components, ammonia and water, having different absorption intensities in the IR spectrum, depending on their content? The same problem exists for the expression "infrared absorption intensity of the sample". Also, the expression is technically incorrect, since it is possible to measure "infrared absorption *spectrum* of the sample", but not its intensity, since intensity is the parameter of a *signal* of the compound, rather than the compound itself.

It is not clear from the claims, what is the difference between "a gaseous phase moiety of liquefied ammonia having a water concentration of 10 ppm or less" serving as a reference gas, and "ammonia as a sample"? Does the reference gas contain exact and known amount of water? If it does not contain exact and known amount of water, how can it be a reference gas? What is "ammonia as a sample"? Is it liquefied ammonia, or a gas?

The expression "measured intensity of the sample" in the last subparagraph is not clear. What does it mean? How the sample can have intensity? Is this a measured intensity of the absorption signal of water or something else? "The background absorption intensity" of which component is meant in the last sentence? Again, "intensity" refers to a certain signal. It cannot be referred to an entire spectrum.

Claim 22 is unclear as to what is being measured and what is being used as a reference gas. Claim 1 recites "introducing a gaseous phase moiety of liquefied ammonia having a water concentration of 10 ppm or less as a reference gas". Claim 22 recites, "measuring a water concentration in ammonia having a water concentration of 10 ppm or less", wherein as the first step the "gaseous phase moiety of liquefied ammonia" is introduced as a reference gas. How these two gases, the one that is measured and the one that is used as a reference gas, differ?

Since the term "a gaseous phase moiety of liquefied ammonia" is not defined in the specification in clear and unambiguous terms, and it is not clear, if this is a gas of crude ammonia, or refined gas, a gas containing a known amount of water, an unknown amount of water, a negligible amount of water, etc., the examiner will interpret this term in the broadest meaning, i.e. as any ammonia gas, obtained from liquefied ammonia, which contains less than 10 ppm of water.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

12. **Claims 1-2, 5-10, 13, 15-16 and 23-24** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kastle et al. (Microcontamination) and Girard et al. (ISSM), as presented by Wu (Anal. Chem.) (no Abstract or full paper of Kastle is available to the examiner due to the copyright protection).

Wu indicates, "Kastle et al. first demonstrated the detection of moisture in ammonia using a tunable lead salt diode laser and a 10-m multipass White cell. To avoid the effect of ammonia absorption, the strongest H₂O absorption lines in the mid-infrared spectral region were not selected, but two H₂O absorption lines at 1923.162 cm⁻¹ and 1922.342 cm⁻¹ were utilized, at which the absorption of NH₃ molecules were relatively small. As a result a detection limit of a few ppm was

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obtained" (page 3316, left column). The description does not contain any details of measurements; therefore, it is not clear, if any reference gas was used as a background.

Girard discloses measurements of water traces (in ppb) in NH_3 by NIR using purified NH_3 gas as a reference, subtracting its spectrum as a background. He also indicates that this method is used for determining remaining moisture in purified gases used in microelectronic manufacturing industry.

It would have been obvious for anyone of ordinary skill in the art to modify Kastle's method (in the case it does not comprise this step already) by using reference purified NH_3 gas in order to obtain the background spectrum, which is subtracted from the spectrum of the analyte, because it obviously improves the quality of the water content measurements due to corrections of the spectrum for the presence of remaining NH_3 signal.

13. **Claim 14** is rejected under 35 U.S.C. 103(a) as being unpatentable over Kastle and Girard, as applied to claims 1-2, 5-10, 13 and 15-16 above, and further in view of Muromura (US 4,075,306).

Kastle and Girard do not specify the way of drying ammonia.

Muromura teaches drying ammonia gas stream using sodium metal.

It would have been obvious for anyone of ordinary skills in the art to apply Kastle-Girard's method of measuring water trace in ammonia, which is dried according to Muromura's method, because the aim of Kastle-Girard's method is determining remaining moisture in dried ammonia.

Response to Remarks and Arguments

14. Applicants' arguments filed 01/20/04 have been fully considered but they are not persuasive.

Regarding the most serious enablement problem of the method disclosed, which concerns measurements of traces of water in range of 0.1-1 ppm on the basis of a reference gas which may contain up to 10 ppm of water, the Applicants just

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repeat an essence of the method the way it was disclosed in the specification. There was no question on how the method was supposed to be performed regarding its steps. There was an issue of enablement for measuring water traces in ammonia, using a reference gas, which may have 10-100 times more water than the sample. Moreover, the reference gas, which may have such an amount of water, is considered "free of water", while it is used for measurements of the sample having 1/100 of this "negligible" amount of water. The Applicants did not explain how it is possible to do so and did not answer the questions raised by the examiner. Moreover, the assumption made by the Applicants, i.e. "**if it is assumed** that the moisture levels in the liquid phases of the two containers are the same" makes the whole method questionable, since there is no way to test, if two containers have the same moisture level. Also, when the measurements are made on the level of 0.1 ppm, it is not clear, what difference in moisture level in two containers will be considered still within the measurement error in order to apply this method.

Regarding the expression "measuring infrared absorption intensity of the reference (sample) gas", the examiner once more would like to emphasize that this is a technically incorrect expression. First of all, the "gas" itself does not have "absorption intensity". It is its signal that has such intensity. However, in the present case the sample gas comprises two compounds with completely different absorption intensities – water and ammonia. Therefore, it is totally unclear, what is meant by this expression, as was already indicated in the previous Office action. Clarification of the language of the claims is required.

As for the insignificance of the origin of the reference gas, such remark given by the Applicants raises even more questions regarding the method disclosed. Not only does it disagree with the prior art, which emphasizes importance of real dryness of the ammonia gas reference in order to make accurate measurements of the moisture level in the real sample, but it also contradicts the disclosure of the instant application, which discloses "gaseous phase of *purified ammonia distillate*" as the reference gas in its only Example. This statement of the applicant is unclear and brings even more problems into the explanation of the method discussed.

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Regarding the rejection over the prior art. The Applicants constantly refer to the NIR region of the absorption spectra employed by Girard, which was not used by the examiner in the rejections. Girard's secondary reference was applied exclusively to fill the gap of the primary reference, which lacks the full disclosure because of the copyright protection. It is naturally to suggest that the primary reference discloses calibration using the reference gas, because this is a standard way of IR measurements of a compound in the presence of the interfering compound (or the background). However, rather than assuming such disclosure, the examiner used a secondary reference, which fills this gap. While the second reference discloses NIR frequencies, rather than IR frequencies, these frequencies have nothing to do with the rejections established by the examiner. Girard is not used as the primary reference, contrary to how the Applicants represent it in their arguments, and therefore such arguments can be considered irrelevant to the rejections established in the previous Office action. The primary reference of Kastle does disclose the frequencies recited in the instant claims.

Regarding Muromura's reference, the Applicants for some reason consider it separately from all other references it was combined with in the rejection. The examiner did not apply Muromura's reference as teaching the disclosed method. Muromura only teaches the way of drying ammonia gas. Drying of ammonia gas is a part of the instant invention; the way it is done in the present method is taught by Muromura. The examiner does not quite understand, why Muromura is referred to outside of the context of his teaching as applied to Kastle-Girard's method. It is also unclear, why Muromura, who teaches exactly the same method of drying ammonia gas as the instant application, "is irrelevant to the present invention".

The examiner would like to ask the Applicants to answer all the questions in a straightforward way, without repeating all details of the issues raised by the examiner, to make the arguments more focused, clearer and easier to understand.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

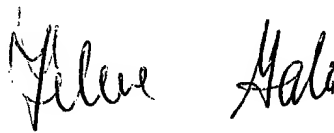
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yelena G. Gakh, Ph.D. whose telephone number is (571) 272-1257. The examiner can normally be reached on 9:30 am - 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill A. Warden can be reached on (571) 272-1267. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Yelena G. Gakh
3/18/04

Handwritten signature of Yelena G. Gakh in black ink.